VI Semester Syllabi – Computer Science & Engineering

Sr. No.	Course Code	Course Name	L	T	P	Credits
1	CS3CO14	Compiler Design	3	1	2	5
2	CS3CO15	Object Oriented Analysis and Design	3	1	2	5
3	CS3ELXX	Elective-4	3	0	0	3
4	CS3ELXX	Elective-5	3	0	0	3
5	CS3ELXX	Elective-6	3	0	0	3
6	EN3MC01	Open Learning Courses	1	0	0	0
7	OE000XX	Open Elective-01	3	0	0	3
		Total	**19**	**2**	**4**	22
		Total Contact Hours	25			

Program Electives:

CS3EA07: Machine Learning
CS3EA05: Evolutionary Algorithms
CS3EL06: Internet of Things
CS3EL01: Information Storage and Management
CS3EI08: Information Security
CS3EL05: Ad-hoc Network
CS3EA06: Natural Language Processing
CS3EA04: Pattern Recognition
CS3ED06: Data Science
CS3EL10: Cloud Computing

Open Elective:

OE00015: Agile Development
OE00016: Blockchain Architecture
OE00017: Virtualization
OE00018: Python Essential
OE00019: Biometrics
OE00020: ICT in Practice

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CS3CO14	Compiler Design	3	1	2	5

UNIT I

Basic machine, FSM, Transition graph, Transition matrix, Deterministic and non-deterministic FSM'S.Equivalence of DFA and NDFA, Regular Expressions, CFG, Chomsky Hierarchy of Language, Derivation and Parse Tree, Ambiguity

UNIT II

Compiler structure: Pass Structure of compiler, Translators, Phases of Compilers, Lexical Analyzer: Role of Lexical Analyzer, Specification of tokens, Recognition of tokens and input Buffering, The Syntactic Specification of Programming Languages, Cross Compiler, bootstrap Compiler

UNIT III

Basic Parsing Techniques: Top Down parsers, Recursive Descent Parsers, Predictive Parsers. Bottom Up Parsing: Operator precedence parsing, LR parsers, Construction of SLR, Canonical LR and LALR parsing tables.

UNIT IV

Syntax Directed Definition, Translation Scheme, Synthesized and inherited attributes, dependency graph, Construction of syntax trees, S-attributed and L-attributed definitions, Three address codes, quadruples, triples and indirect triples, Translation of assignment statements.

UNIT V

Storage organization, activation trees, activation records, allocation strategies, Parameter passing symbol table, dynamic storage allocation, Basic blocks and flow graphs, Optimization of basic blocks, Loop optimization, Global data flow analysis, Loop invariant computations.

Text Book

1. K.L.P. Mishra, Theory of computer Science, Prentice Hall of India Pvt. Ltd.
2. Principle of Compiler Design, Alfred V. Aho, and J.D. Ullman, Narosa Publication.
3. John E. Hopcroft, Jeffery Ullman, Introduction to Automata theory, Langauges & computation, Narosa Publishers.

Reference Book

1. Compiler design in C, A.C. Holub, PHI.
2. Compiler construction (Theory and Practice), A.Barret William and R.M. Bates, Galgotia Publication.
3. Compiler Design, Kakde.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CS3CO15	Object Oriented Analysis and Design	3	1	2	5

UNIT I

Structure of Complex Systems, Object Oriented Development Methods, Characteristics of Objects, Fundamental Concepts of Object orientation, UML- Overview, RUP and its Phases

UNIT II

Models, Concepts in UML, Structural and Behavioral Models, Use Cases and functional Requirements, Use Case Descriptions,Classes, Relationships, Association, Generalization, Realization, Dependencies, Constraints

UNIT III

State Machine View, Activity View, Interaction View, Sequence Diagram, Collaboration Diagram, Interaction Diagrams

UNIT IV

Physical View, Component Diagram, Deployment Diagram, Package, Dependencies on Packages, Modelling System and Subsystems, Patterns and Types of Patterns, Applying Patterns

UNIT V

Object Oriented Testing, Types of Testing, Quality Assurance Methods, Reusability, Reverse Engineering, Case Studies

Text Book

1. Grady Booch, Object Oriented Analysis and Design with Applications, Addison Wesley
2. James Rambaugh, Ivar Jacobson, Grady Booch, The Unified Modelling Language Reference Manual, Addison Wesley

Reference Book

1. Design Patterns - Elements of Reusable Object-Oriented Software, Gamma, et. al., Addison-Wesley.
2. Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and IterativeDevelopment, by Craig Larman, Pearson Education.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CS3EA07	Machine Learning	3	0	0	3

UNIT I:Introduction to machine learning, Applications, prediction, decision making, inference; Supervised Learning: Distance-based methods, Nearest-Neighbors, Decision Trees, Naïve Bayes; Linear models: Linear Regression, Logistic Regression

UNIT-II: Classification: Generalized Linear Models, Support Vector Machines, Nonlinearity and Kernel Methods, Beyond Binary Classification: Multi-class/Structured Outputs, Ranking

UNIT III: Unsupervised Learning: Clustering: K-means/Kernel K-means, Dimensionality Reduction: PCA and kernel PCA, Matrix Factorization and Matrix Completion, Generative Models (mixture models and latent factor models)

UNIT IV: Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests), Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data

UNIT V: Deep Learning and Feature Representation Learning, Scalable Machine Learning (Online and Distributed Learning), Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference

Text Book:

1. Machine Learning, Tom Mitchell, McGraw Hill.
2. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press.
3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer (freely available online)

Reference Books:

1. Christopher Bishop, Pattern Recognition and Machine Learning, Springer.
2. Hal Daumé III, A Course in Machine Learning (freely available online)
3. Sebastian Raschka, Vahid Mirjalili, Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, and TensorFlow, Packt Publishing.

Course Code	Course Name	Hours per			Total Credits
		L	T	P	
CS3EA05/IT3EA05	Evolutionary Algorithms	3	0	0	3

PROPOSED

UNIT I: Optimization background and terminology: Gradient optimization methods, sampling methods, linear programming, combinatorial optimization. Principles of Evolutionary Process , A History of Evolutionary Computation, strengths and weaknesses of the evolutionary model. Inductive bias.

UNIT II: Evolutionary Biology background and terminology: Genotype and phenotype, unit of selection, genes and traits, chromosomes, alleles, diploid and haploid, fitness, mutation and recombination. Selection, variation and landscapes. Genetic Algorithms: Representation, operators, and standard algorithm. The building block hypothesis and the schema theorem.

UNIT III:
Evolutionary strategies: Evolution in continuous variables. Transformations. Genetic Programming. Building blocks and architecture-altering operators. Libraries and Trees. Selection mechanisms: Fitness proportionate, rank, tournament, Stochastic Universal Sampling and Boltzman selection methods. Niching methods. Spatial methods. Consequences of selection models.

UNIT IV: Artificial landscapes and test functions: The Two-armed bandit problem. Multi-modal and deceptive functions. Royal roads. N-k landscapes. Hierarchical and fractal functions. Pareto evolution.
Co-evolution: Multiple populations and single-population co-evolution, relative and absolute fitness, engagement and gradient loss, the red queen effect. The credit assignment problem. Swarm intelligence, particle swarm optimization

UNIT V: Neural Network Structures , Perceptrons, Training Single Layer NNs, Training Multilayer NNs: Back Propagation, Empirical Risk Minimization, Optimization Methods and Generalization, Artificial Neural Networks for Classification and regression, Multilayer Feedforward Neural networks with Sigmoidal activation functions; Backpropagation Algorithm; Representational abilities of feedforward networks , Evolutionary Neural Networks

Text books

1. Melanie Mitchell, (1996) An introduction to genetic algorithms, MIT
2. John Koza et al, Genetic Programming IV - Routine Human-Competitive Machine Intelligence, Morgan.

Reference books

1. Goldberg D.E. Genetic Algorithms in Search, Optimization and Machine Learning, Pearson Education.
2. K. Shrinivasa Raju and D. Nagesh Kumar, Multivriterion Analysis in Engineering and Management, PHI Learning.

Course Code	Course Name	Hours per			Total
		L	T	P	Credits
CS3EL06/IT3EL06	Internet of Things	3	0	0	3

UNIT-I

Introduction : Definition, Characteristics of IoT, IoT Architectural view, Physical design of IoT, IoT Protocols, Communication Models of IoT, IoT Communication APIs, IoT Enabling Technologies.

UNIT-II

IoT and M2M: Machine-to-Machine (M2M), Difference between M2M and IoT, SDN (Software Defined Networking) and NFV (Network Function Virtualization) for IoT, Data Storage in IoT, IoT Cloud Based Services.

UNIT –III

IoT Platform Design Methodology: Specifications of Purpose and Requirement, Process, Domain Model, Information Model, Service, IoT Level, Functional View, Operational View, Device and Component Integration, Application Development.

UNIT –IV

Security issues in IoT: Introduction, Vulnerabilities, Security requirements and threat analysis, IoT security Tomography, layered attacker model, identity management and establishment, access control.

UNIT-V

Application areas of IoT: Home Automation, smart lighting, home intrusion detection, smart cities, smart parking, environment, weather monitoring system, agriculture.

Text Books:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press.
2. Rajkamal,"Internet of Things", Tata McGraw Hill publication

Reference Books:

1. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley
2. Donald Norris "The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black", McGraw Hill publication.

Open Learning Source:

1. https://nptel.ac.in/courses/106105166/
2. https://github.com/connectIOT/iottoolkit

Reference Books

1. Francis dacosta "Rethinking the Internet of things:A scalable Approach to connecting everything", 1st edition, Apress publications 2013.
2. Donald Norris"The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black", McGraw Hill publication.

Course Code	Course Name	Hours per			Total
		L	T	P	Credits
CS3EL03/IT3EL03	Information Storage and Management	3	0	0	3

UNIT-I Introduction to Storage Technology:Data proliferation, evolution of various storage technologies, Overview of storage infrastructure components, Information Lifecycle Management, Data categorization.

UNIT-II Storage Systems Architecture: Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications. RAID levels & parity algorithms, hot sparing, Front end to host storage provisioning, mapping and operation.

UNIT-III Introduction to Networked Storage: JBOD, DAS, NAS, SAN & CAS evolution and comparison. Applications, Elements, connectivity, standards, management, security and limitations of DAS, NAS, CAS & SAN.

UNIT –IV Hybrid Storage solutions; Virtualization: Memory, network, server, storage & appliances. Data center concepts & requirements, Backup & Disaster Recovery: Principles Managing & Monitoring: Industry management standards (SNMP, SMI-S, CIM), standard framework applications, Key management metrics (Thresholds, availability, capacity, security, performance).

UNIT-V Information storage on cloud :Concept of Cloud, Cloud Computing, storage on Cloud, Cloud Vocabulary, Architectural Framework, Cloud benefits, Cloud computing Evolution, Applications & services on cloud, Cloud service providers and Models, Essential characteristics of cloud computing, Cloud Security and integration.

Text Books:

1. G. Somasundaram & Alok Shrivastava (EMC Education Services) editors; Information Storage and Management: Storing, Managing, and Protecting Digital Information; Wiley India.
2. Ulf Troppens, Wolfgang Mueller-Friedt, Rainer Erkens, Rainer Wolafka, Nils Haustein; Storage Network explained : Basic and application of fiber channels, SAN, NAS, iSESI, INFINIBAND and FCOE, Wiley India.

References:

1. John W. Rittinghouse and James F. Ransome; Cloud Computing : Implementation , Management and Security, CRC Press, Taylor Frances Pub.
2. Nick Antonopoulos, Lee Gillam; Cloud Computing : Principles, System & Application, Springer.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CS3EI08/IT3EI08	Information Security	3	0	0	3

UNIT-I: Introduction to Information Security: Security Attacks, Security Services, Classical Encryption Techniques, Symmetric Cipher Model, Substitution techniques, Transposition techniques, Steganography.

UNIT-II: Block Cipher Principles, Data Encryption Standard (DES), Differential and Linear Cryptanalysis, Modular Arithmetic, Euclidean Algorithm, Advanced Encryption Standard (AES).

UNIT-III: Public key cryptography: Principles of Public key Cryptosystems, RSA algorithm, Key Management, Diffie Hellman Key Exchange, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.

UNIT-IV Message Authentication and Hash Functions: Message Authentication codes, Secure Hash Algorithm, HMAC, Digital Signature, Authentication Protocol, Digital Signature Standards.

UNIT V: Authentication Applications: Kerberos, X.509 Authentication service, Pretty Good Privacy, S/MIME, IP Security, Firewalls.

Text Book

1. Stallings William, Cryptography and Network Security, Pearson Education
2. William Stallings and Lawrie Brown, Larry Brown , Computer Security: Principles and Practice, Pearson

References Book

1. Introduction to Computer Security, 2004 Matt Bishop, Addison-Wesley
2. Buchmann J. A., Introduction to Cryptography, Springer Verlag
3. Schneier Bruce, Applied Cryptography, John Wiley an d Sons
4. Cryptography and Network Security: Atul Kahate, TMH

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
CS3EL05/IT3EL05	Ad-hoc Networks	3	0	0	3

UNIT I

Introduction to Ad hoc networks, Definition, characteristics features, applications, characteristics of wireless channel, architecture of Ad hoc network.

UNIT II

Medium access protocol MAC, design issues, goals, classification, contention based protocols, IEEE standards 802.11, 802.15 and HIPERLAN.

UNIT III

Routing protocols for Ad hoc Network, Design issues, classifications, Table driven routing protocol, Destination Sequenced Distance-Vector Routing Protocol, Cluster-Head Gateway switch routing protocol, On Demand routing protocol, Dynamic source routing protocol, Ad hoc On Demand Distance Vector Routing Protocol.

UNIT IV

Transport layer and security protocols for Ad hoc Network, design issues, goals, classifications, security in Ad hoc network, issues and challenges in security provisioning, Network security attacks.

UNIT V

Secure routing in Ad hoc network, requirement, security aware Ad hoc routing protocols, Introduction to wireless sensor network, Applications of sensor network, comparison with Ad hoc wireless network.

Text Books

1. C. Siva Ram Murthy and B.S. Manoj, Ad Hoc Wireless Networks Architectures and Protocols, , Prentice Hall
2. Charles E. Perkins, "Ad hoc Networking," Addison-Wesley

Reference Books

1. Carlos de Morais Cordeiro and Dharma Agrawal, Ad Hoc and Sensor Networks: Theory and Applications, World Scientific
2. Mohammad Ilyas, The Handbook of Ad hoc Wireless Networks, CRC Press
3. C. K. Toh, Adhoc Mobile Wireless Protocol: Protocols and Systems, Pearson

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CS3EA06/IT3EA06	Natural Language Processing	3	0	0	3

UNIT-I

Introduction: Human languages, Main approach of NLP, Knowledge in speech and language processing, Ambiguity, Models and algorithms, Formal language and Natural Language, Regular Expression and automata.

UNIT-II

Text Pre-processing, Tokenization, Feature Extraction from text, Morphology: Inflectional and Derivational, Finite state morphological parsing, Finite state transducer Part of Speech Tagging: Rule based, Stochastic POS, Transformation based tagging.

UNIT-III

Speech Processing: Speech and phonetics, Vocal organ, Phonological rules and Transducer, Probabilistic models: Spelling error, Bayesian method to spelling, Minimum edit distance, Bayesian method of pronunciation variation.

UNIT-IV

N-Grams: Simple N-Gram, perplexity, Smoothing, Backoff, Entropy, Parsing: Statistical Parsing, Probabilistic parsing, TreeBank.

UNIT-V

Application: Sentiment analysis, Spelling correction, Word sense disambiguation, Machine translation, Text Classification, Question answering system.

Text Book

1. Daniel Jurafsky and James H.Martin, "Speech and Language Processing", Pearson Education.
2. James Allen, "Natural Language Understanding", Pearson Education.

Reference book

1. Christopher D. Manning and Hinrich Schutze, "Foundation of statistical Natural Language Processing", MIT Press.
2. Mary Dee Harris "Introduction to Natural language Processing", Reston .

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CS3EA04/IT3EA04	Pattern Recognition	3	0	0	3

UNIT- I

Overview of pattern recognition, Supervised learning, Bayes Decision Theory: Minimum-error-rate classification, Classifiers, Decision surfaces, discriminant function; Decision trees: CART, Bayesian Belief Network.

UNIT- II

Parameter Estimation Methods: Maximum-Likelihood estimation: Gaussian case; Bayesian parameter estimation: Gaussian case, Gibbs Algorithm, Hidden Markov Models (HMMs)

UNIT- III

Dimensionality reduction: Problems of Dimensionality, Principal component analysis; Fisher discriminant analysis

NonParametric Technique : Parzen windows, k-nearest neighbour estimation.

UNIT- IV

Unsupervised learning : Algorithms for clustering: K-Means, Unsupervised Bayesian learning, Criterion functions for clustering; Hierarchical, partitional and online clustering methods.

UNIT- V

Support Vector Machines, Pattern recognition applications: Image analysis, Biometrics: Face and speech recognition, OCR.

Text Book

1. Richard O. Duda, Peter E. Hart and D G. Stork, "Pattern Classification", Wiley.
2. Sergios Theodoridis and Konstantinos Koutroumbas, "Pattern Recognition", Academic Press.

Reference Books

1. Tou and Gonzales, "Pattern Recognition Principles", Wesley Publication Company.
2. Earl Gose, Richard Johnsonbaugh, Steve Jost "Pattern Recognition and Image Analysis",
PHI Learning.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CS3EL10	Cloud Computing	3	0	0	3

UNIT I

Introduction to cloud computing, characteristics of cloud computing as per NIST, cloud reference model, application of cloud computing ECG analysis, protein structure prediction, cloud deployment models.

UNIT II

Virtualization, virtualization advantages, Full virtualization, para-virtualization, hypervisors. Cloud interoperability, cloud service management, cloud analytics, Cloud broker, Capex, Opex, cloud architecture.

UNIT III

Platform as a service, Infrastructure as a service, software as a service, Desktop as a service, Backup as a service, DRaaS, Introduction to SLA, SLA lifecycle, SLA management, Business continuity plan.

UNIT IV

Cloud security fundamentals, vulnerability assessment, security architecture, identity management and access control, data at rest, data in flight, data in motion, security in virtualization.

UNIT V

Cloud application development platforms, Xen hypervisor, AWS, Google app engine, open stack.

Text Books

1. S. Chand,R.Buyya, C. Vecchiola, S.T. Selvi, "Mastering Cloud Computing." McGraw Hill Education
2. T. Velte, A. Velte and R. Estenpeter, "Cloud Computing –A practical approach, McGraw Hill Education

Reference Books

1. K. Chandrasekaran, "Essentials of Cloud Computing," CRC Press
2. Thomas Erl, Zaigham Mahmood, RichardoPuttini, Cloud Computing: Concepts, Technology & Architecture, ServiceTech press
3. K Jayaswal, J Kallakurchi, Donald Houde, Deven Shah, Cloud Computing Black Book, Dreamtech Press.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
OE00015	Agile Development	3	0	0	3

UNIT-I

Understanding Agile: Introduction to Agile Project Management, Agile Manifesto, Agile Principles, Agile Benefits: Product Development and customers, Development teams etc.

UNIT-II

Agile Frameworks: Agile approaches, reviewing the big three: Lean, Extreme programming and Scrum. Putting Agile in action: Environment, Behaviors- Agile roles, New values, Team philosophy.

UNIT-III

Working in Agile: Planning in Agile, product vision, creating the product roadmap, refining requirement and estimates, release planning and Sprint planning.

UNIT-IV

Managing in Agile: Managing Scope and procurement, managing time and cost, team dynamics and communication, managing quality and risk

UNIT-V

Ensuring Agile Success: Building a foundation- Commitment, choosing the right project team members-Development team, scrum master etc. Being a change agent, Key benefits and key resources for agile project management.

Text Books

1. Mark C. Layton, Agile Project Management For Dummies, Wiley publishers
2. Jim Robert Highsmith, Agile Project Management: Creating Innovative Products, Pearson education
3. Hitzler, Markus, Rudolph , Foundations of Semantic Web Technologies, Chapman & Hall/CRC
4. Allemang , Hendler , Semantic Web for the working Ontologist, Elsevier Pub

Reference Books

1. Charles G. Cobb, Making Sense of Agile Project Management: Balancing Control and Agility, Wiley
2. Mike Cohn, Agile Estimating and Planning, Pearson
3. Liz Sedley and Rachel Davies, Agile Coaching, The Pragmetic Bookshelf

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
OE00016	Blockchain Architecture	3	0	0	3

UNIT ICryptocurrency: History, electronic cash, double spending problem, Bitcoin protocols, Mining strategy and rewards, Types of crypto currency wallets, Legal aspects of crypto currency, Crypto currency exchanges.

UNIT IIIntroduction to Blockchain: History of blockchain, Hash functions, SHA-256, Symmetric cryptography, Asymmetric cryptography, Keys & Digital signatures, benefits and limitation of block chain, features of blockchain.

UNIT IIIConsensus: Nakamoto consensus, Proof of work, Proof of stake, Proof of burn, Difficulty Level, Sybil attack, Energy utilization, collision of energy utilization, Introduction to ethereum.

UNIT IVBlockchain Architectures: Blockchain network, Merkle patricia Tree, Soft & hard fork, Private and public blockchain, Tokenized blockchain.

UNITVBlockchain Applications: Financial Sector, Medical record management system, domain name service and future of block chain, case study: Government on blockchain. Introduction to hashgraph and tangle.

Text Books

1. Andreas Antonopoulos "Mastering Bitcoin Unlocking Digital Cryptocurrencies" O'Reilly publication.
2. Imran Bashir "Mastering Blockchain: Distributed ledger technology, decentralization, Packt publishing".

Reference Books

1. Wattenhofer, The Science of the Blockchain
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction" Princeton University.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
OE00017	Virtualization	3	0	0	3

UNIT I Virtualization overview: understanding virtualization, importance of virtualization, limitation of traditional Vs Contempory virtualization, virtualization servers, Virtualization desktops, virtualization in cloud.

UNIT II Understanding Hypervisor: History of Hypervisor, Type 1 Hypervisor, Type 2 Hypervisor, role of Hypervisors, resource allocation in hypervisor, comparing virtualization approaches. Kernel virtual machine (KVM),Citrix Xen, Microsoft Hyper-V.

UNIT IIIVirtual Machine: Understanding Virtual machine, taxonomy of virtual machines, network usage in virtual machine, storage usage in virtual machine, understanding containers, Building and managing virtual machine, Application of virtual machine.

UNIT IVVirtual Machine Security: risk associated with virtual machine,virtual machine cloning, virtual machine devices, protecting virtual machines, VM theft, hyper jacking, Protecting cloud servers,

UNIT VCloud management references architecture: Data centre challenges and solutions automating the data centre, goals of automating virtualization.

Text Books

1. Rajkumar Buyya, James Brobeg, Andrej Goscinksi," Cloud computing principles and paradigm", John Wiley & Sons.
2. Matthew Portney, "Virtualization Essentials", second edition, Sybex wiley & Sons.

Reference Books

1. Tim cerfing, Jeff buller, Chuck Enstall, Richard Rueriz, "Mastering Microsoft virtualization", wiley publication.
2. T. Velte, A. Velte and R. Estenpeter, "Cloud Computing –A practical approach, McGraw Hill Education

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
OE00018	Python Essentials	3	0	0	3

UNIT-IBasic Introduction
Introduction to Python, History, Features, command interpreter and development environment-IDLE, Application of Python, Python 2/3 differences, Basic program structure-quotation and indentation, Operator, Basic data types and In-built objects.

UNIT-IIFunction and Sequence
Functions: definition and use, Arguments, Block structure, scope, Recursion, Argument passing, Conditionals and Boolean expressions, Lambda Function, inbuild functions (str(),globals(),locals(),vars(),eval(),exec(),execfile(),repr(),ascii()) Sequences: Strings, Tuples, Lists Iteration, looping and control flow, String methods and formatting.

UNIT-IIIFile Operation & OOPS concepts
Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek.

UNIT-IV OOPS Concepts
Object Oriented concepts- Encapsulation, Polymorphism, Classes, Class instances, Constructors & Destructors__init__,__del__, Multiple inheritance, Operator overloading Properties, Special methods, Emulating built-in types.

UNIT-VMutable data types, Exception and Standard modules
Dictionaries, Sets and Mutability, Exceptions, List and Dict Comprehensions, Standard Modules-math, random Packages.

Text Book
1. Dr.R.Nageswara Rao, Core Python Programming, dreamtech press.
2. Paul Barry, Head First Python, O'REILLY.

Reference Book
1. Mark Luiz, Learning Python, O'REILLY.
2. Jamie Chan, Learn Python in One Day, LCF Publishing.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
CS3ED06	Data Science	3	0	0	3

UNIT I

Introduction to Data Science, Definition and description of Data Science, history and development of Data Science, terminologies related with Data Science, basic framework and architecture, importance of Data Science in today's business world, primary components of Data Science, users of Data Science and its hierarchy, overview of different Data Science techniques.

UNIT II

Sample spaces, events, Conditional probability and independence. Random variables. Discrete and continuous random variables, densities and distributions, Normal distribution and its properties, Introduction to Markov chains, random walks, Descriptive, Predictive and prescriptive statistics, Statistical Inference, Populations and samples, Statistical modeling,

UNIT III

Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA - Philosophy of EDA - The Data Science Process - Case Study:

UNIT IV

Data Visualization: Basic principles, ideas and tools for data visualization, Examples of inspiring (industry) projects, Exercise: create your own visualization of a complex dataset.

UNIT V

NoSQL, use of Python as adata science tool, Python libraries: SciPy and sci-kitLearn, PyBrain, Pylearn, Matplotlib, challenges and scope of Data Science project management.

Text books

1. Data Science from Scratch: First Principles with Python 1st Edition by Joel Grus
2. Principles of Data Science by Sinan Ozdemir, (2016) PACKT.

Reference Books

1. Data Science For Dummies by Lillian Pierson (2015)
2. Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking by Foster Provost, Tom Fawcett